



# IOWA DEPARTMENT OF NATURAL RESOURCES

LEADING IOWANS IN CARING FOR OUR NATURAL RESOURCES

## Mapping Conservation Practices Through GIS Surveys

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## What you can learn about today!

- Project Background
- What practices can be mapped
- How are these practices mapped
- Benefits lightning round!!



## How do you know when the Nutrient Reduction Strategy is successful?

### MEASURABLE INDICATORS OF DESIRABLE CHANGE



#### INPUTS

- People
- Funding
- Agency resources
- Private sector resources



#### HUMAN

- Partner organizations
- Partner agribusinesses
- Farmer knowledge and attitude
- Point source communities and management knowledge and attitude



#### LAND

- Land use changes
- Practice adoption
- Point source implementation



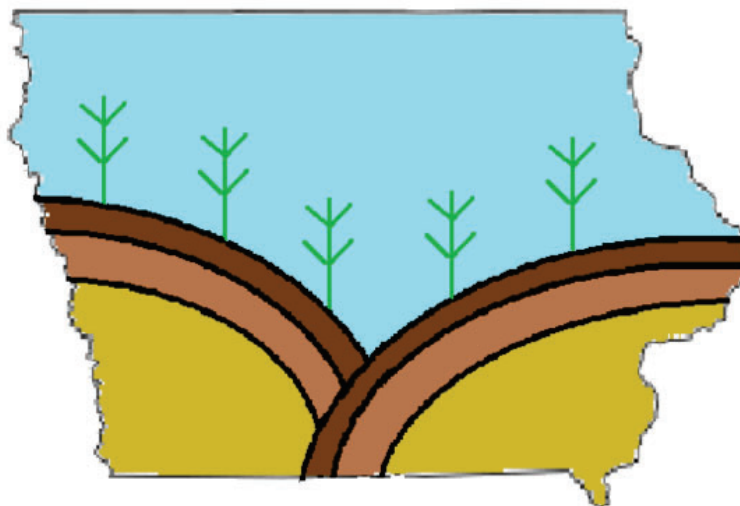
#### WATER

- Calculated load reduction
- Measured loads in priority watersheds
- Organized watersheds reported load changes
- Measured loads at existing monitoring stations

## Project Background

- Who?
  - Iowa Department of Natural Resources
  - Iowa Nutrient Research Education Council
  - Iowa Department of Agriculture and Land Stewardship
  - Iowa State University
- What?
  - Map conservation practices across the state using the state LiDAR imagery
- How?
  - ISU students at the GIS Laboratory (3+ years of work to date)
- Cost?
  - ~\$600,000 either billed or committed to date

## What BMPs can be mapped?



The “Plus” in the 4R Plus



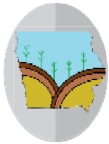
## GRASSED WATERWAYS



**Definition:** Shaped, constructed channels seeded to grass or other vegetation to direct water to a stable outlet.

### Why use grassed waterways:

- Protect field from gully erosion
- Slow down runoff water and channel to an outlet
- Trap sediment and nutrients in vegetation



## CONTOUR FARMING



**Definition:** Contouring means farming with row patterns around hills, not up and down hills. Rows form small dams that slow water flow, increase infiltration and reduce erosion.

### Why use contour farming:

- Reduces sheet and rill erosion
- Decreases transport of sediment and nutrients
- Increases water infiltration





## CONTOUR BUFFER STRIPS/PRAIRIE STRIPS



**Definition:** Strips of grass or grass/legume mix that run along the contour of a farmed field. They alternate down the slope of a field with wider cropped strips.

### Why use contour buffer strips or prairie strips:

- Reduce sheet and rill erosion
- Sediment, nutrients, and pesticides are removed from the runoff as they pass through the strips
- Can be used for forage production
- Provide habitat for wildlife



## TERRACES



**Definition:** Earthen embankments constructed across a field slope following the contour that break long slopes into shorter ones.

### Why install terraces:

- Reduce erosion by reducing slope length
- Reduce the development of gullies
- Retain runoff for moisture conservation
- Trap phosphorus attached to sediment particles



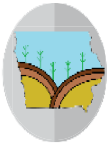
## PONDS



**Definition:** Ponds are pools of water formed by a dam or pit. There are two types of ponds – embankment ponds, which are made by constructing an embankment, and excavated ponds, which are formed by excavating a pit.

**Why install a pond:**

- Prevents soil erosion by eliminating gullies
- Protects water quality by collecting and storing runoff water and nutrients
- Provides water for livestock, fish and wildlife, irrigation, recreational opportunities



## WATER AND SEDIMENT CONTROL BASINS



**Definition:** An earth embankment or a combination of ridges and channels constructed across the slope to form a sediment trap and water detention basin with a stable outlet.

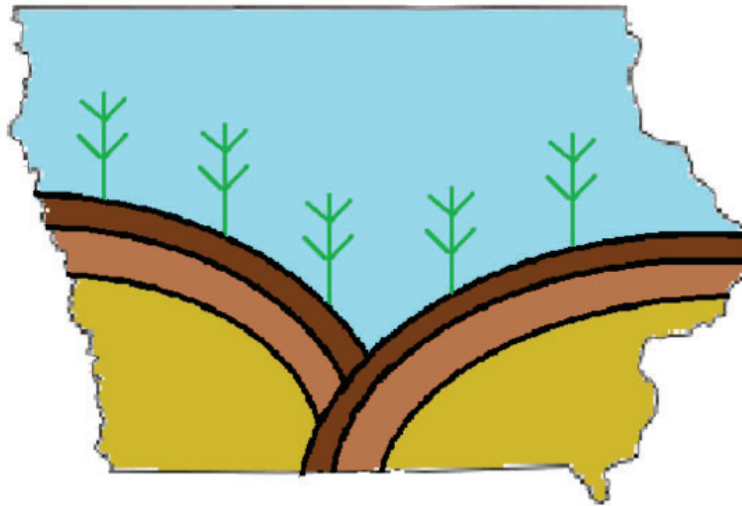
**Why install water and sediment control basins:**

- Slow water movement
- Reduce gully erosion
- Trap sediment and nutrients
- Reduce and manage onsite and downstream runoff





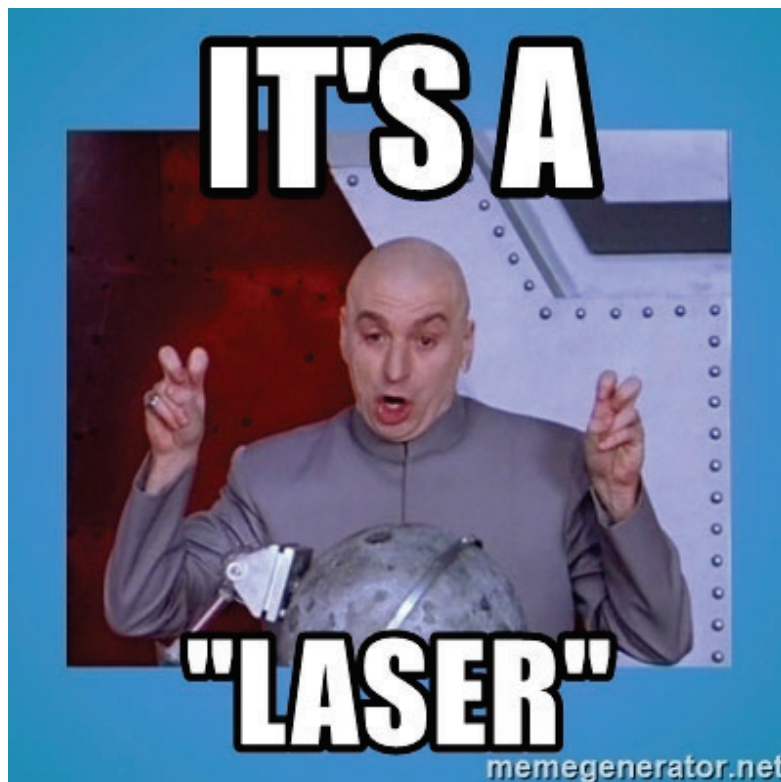
## How are these BMPs mapped?



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## We Have the Technology....





# TERRACES



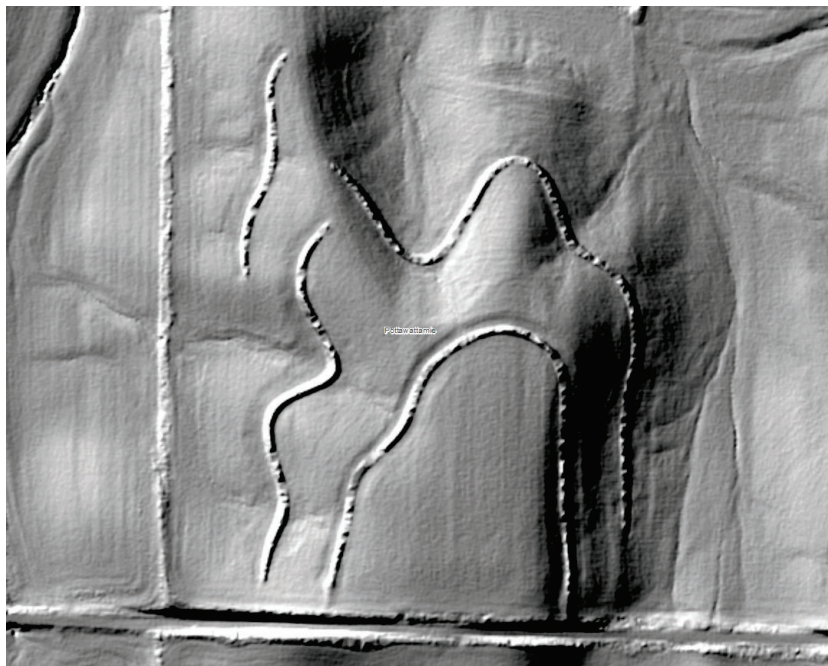
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# LiDAR



## LiDAR with lines



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## CIR



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## NAIP with lines



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## Benefits to mapping structural BMPs

- Establish a baseline to compare future progress to
- Estimate nutrient load reduction
- Estimate conservation investment
- Show historical progress over time and in future
- Evaluate saturation level of BMPs in watershed
- Improved modeling estimates
- Verify ACPF Tool results and streamline BMP implementation

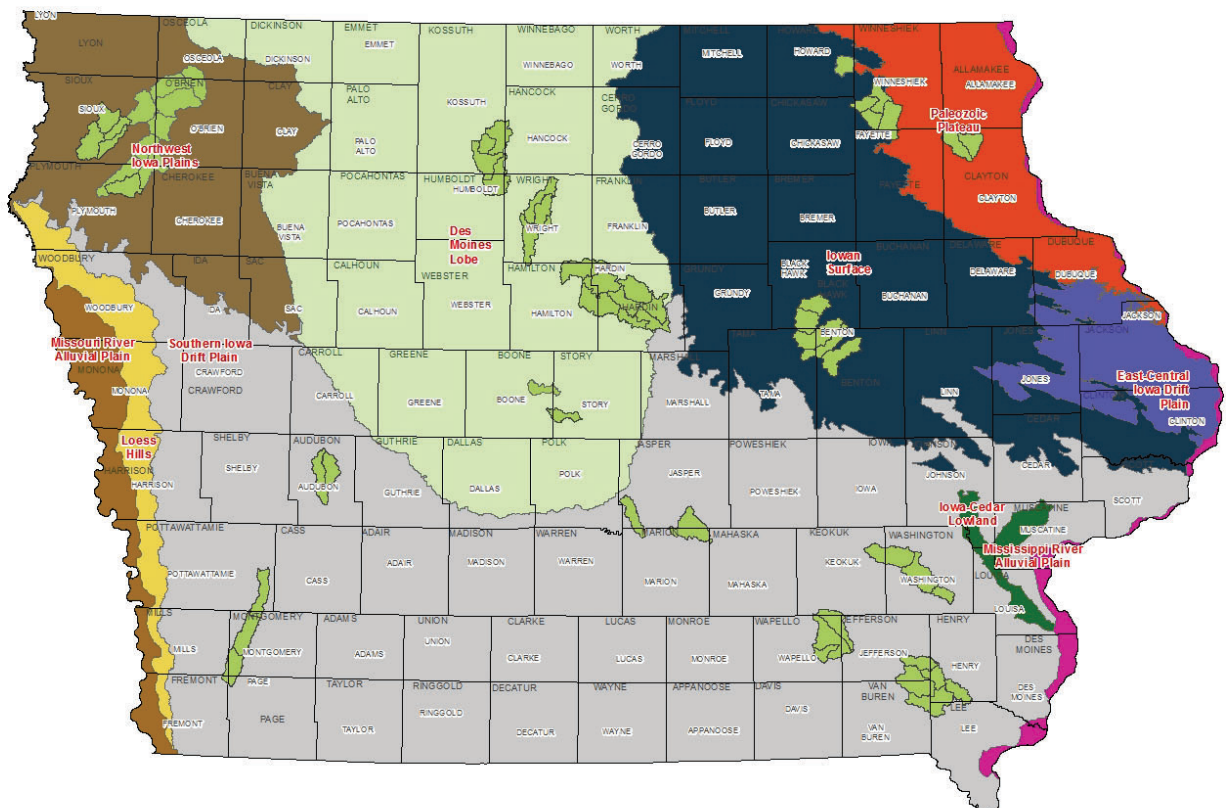
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## Benefits continued...

- Provides a uniform, consistent database to work from for the whole state
- Serve as an educational tool (right practice in the right place)
- Statewide picture – not just one program like CRP
- Not just cost-share, but overall progress over time
- Blind to private or public investment
- State vetted

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# Can track new BMPs using Annual Photography

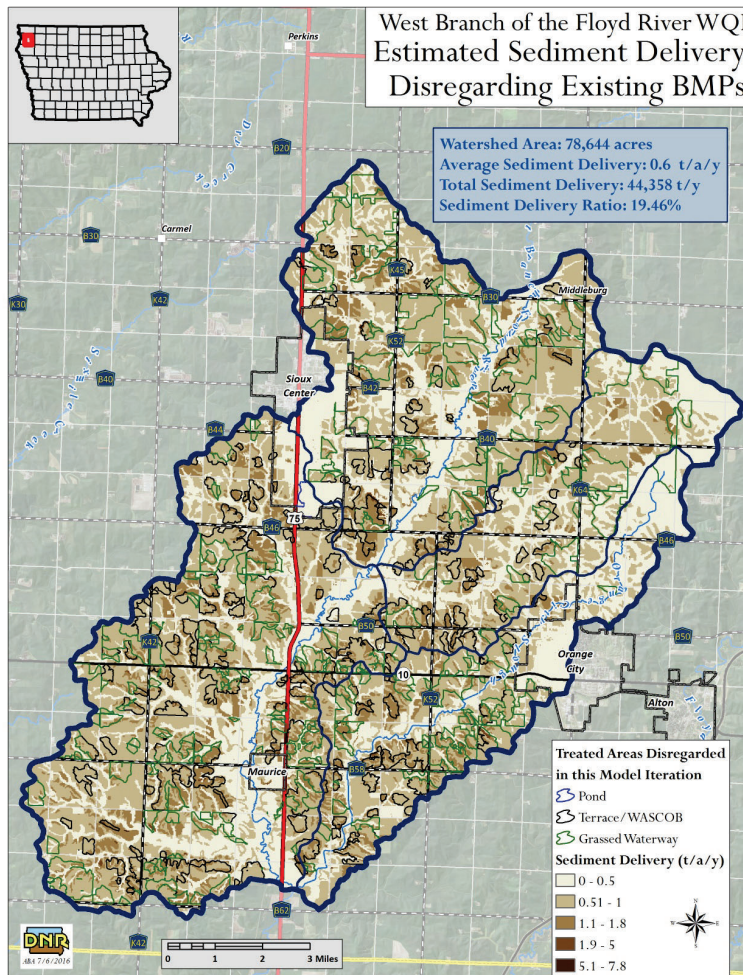


BMPs mapped from LiDAR

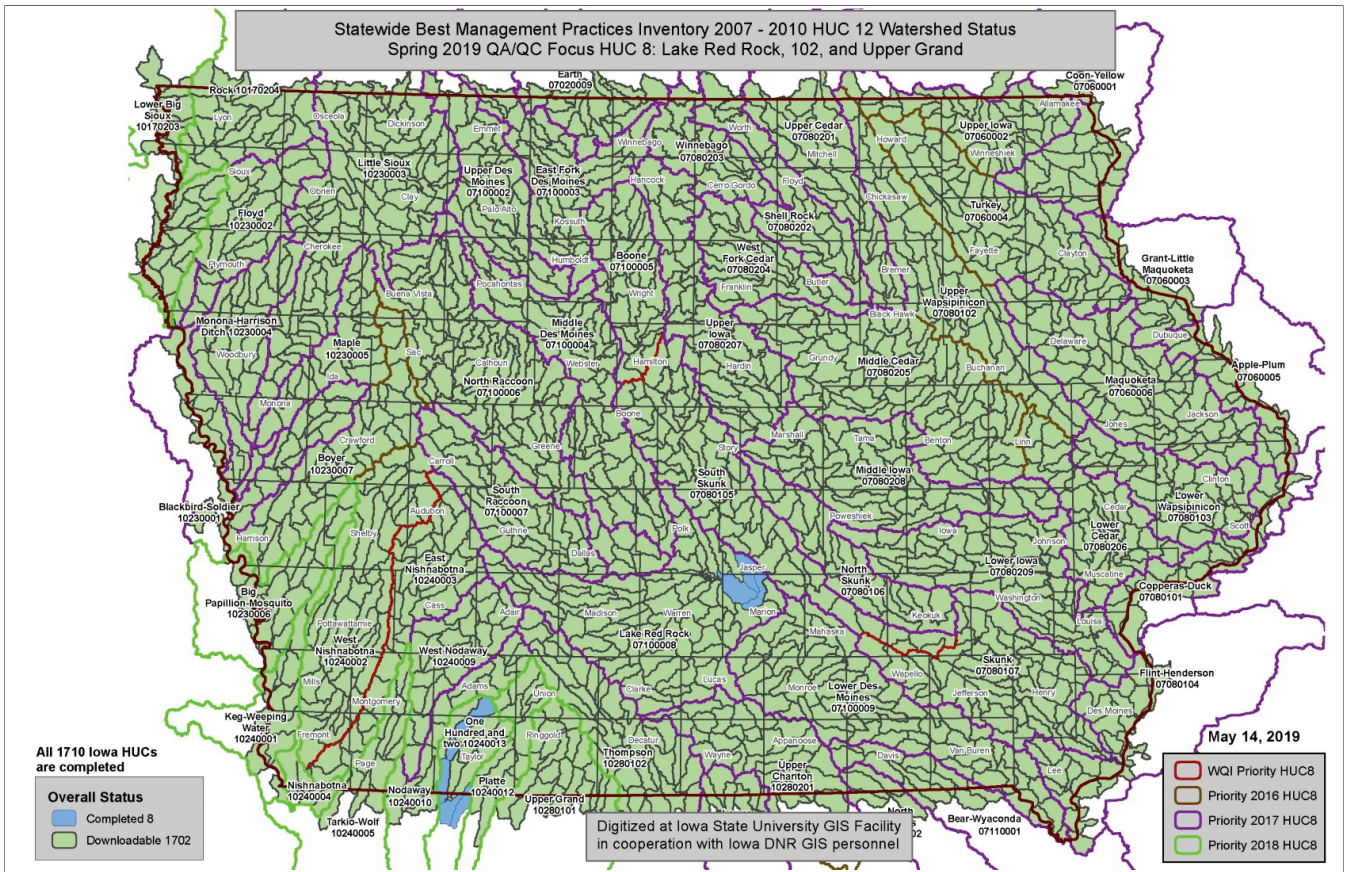
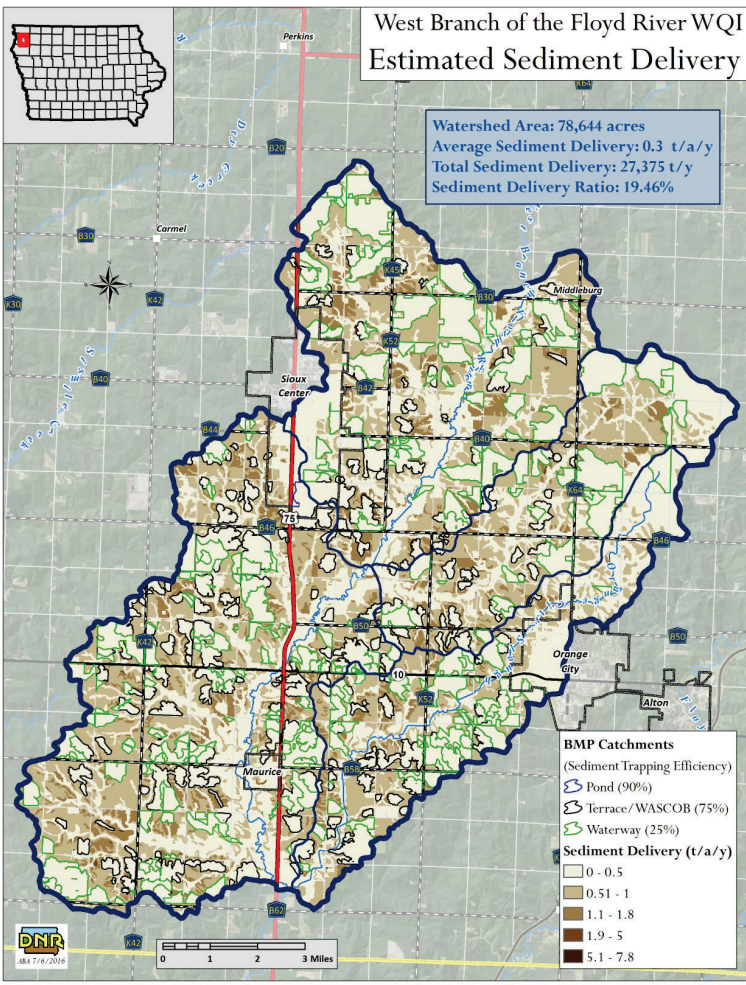


New terraces visible on 2011 photography

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## BMP Mapping Summary for Iowa (as of June 7, 2018)

	HUC 12 Mapped	Pond Dams (number)	Grassed water ways (acres)	Terraces (number)	Terraces (miles)	WASCOBs (number)	WASCOB (miles)	Contour Buffer Strips (acres)	Strip cropping (acres)
<b>Total</b>	1,712	114,423	327,904	506,172	88,874	246,139	12,555	557,731	109,872

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## Conservation Investment To Date

- State finalized (~36,000,000 acres)

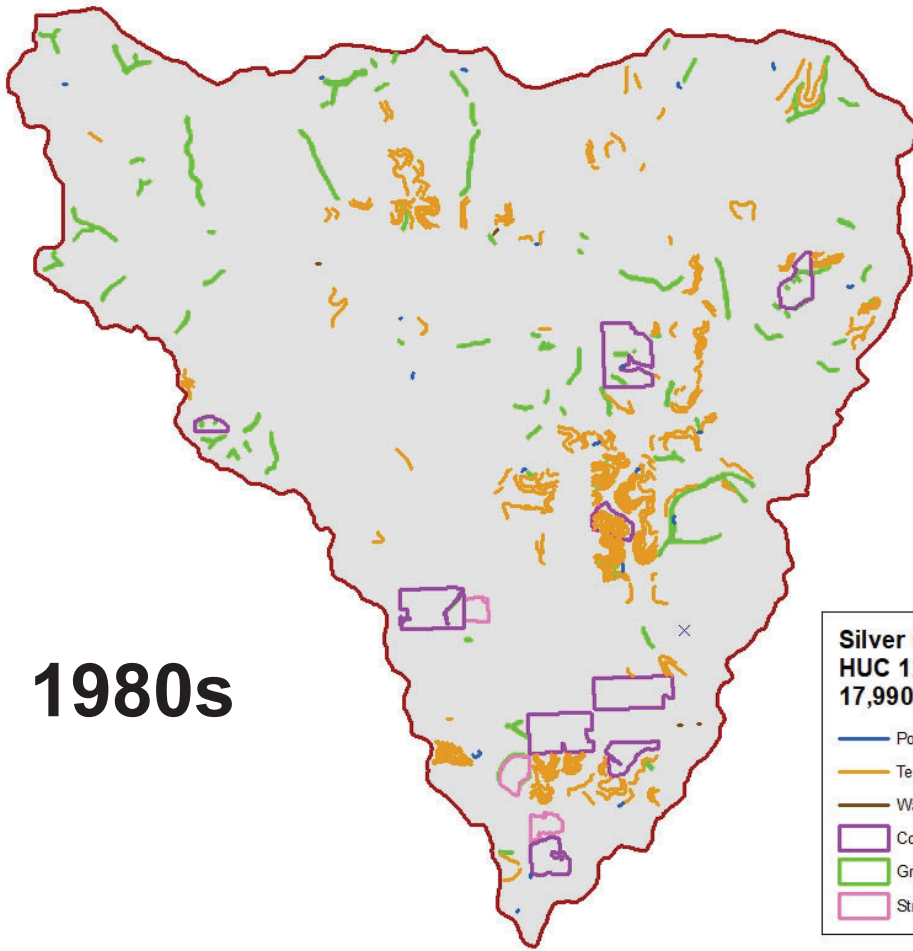
grassed waterways	= \$1,317,000,000
terraces	= \$2,116,000,000
WASCOBs	= \$ 787,000,000
Ponds	= \$2,002,000,000
<b>Total</b>	<b>= \$6,224,000,000</b>

**~\$3,600,000 per HUC12 watershed**

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





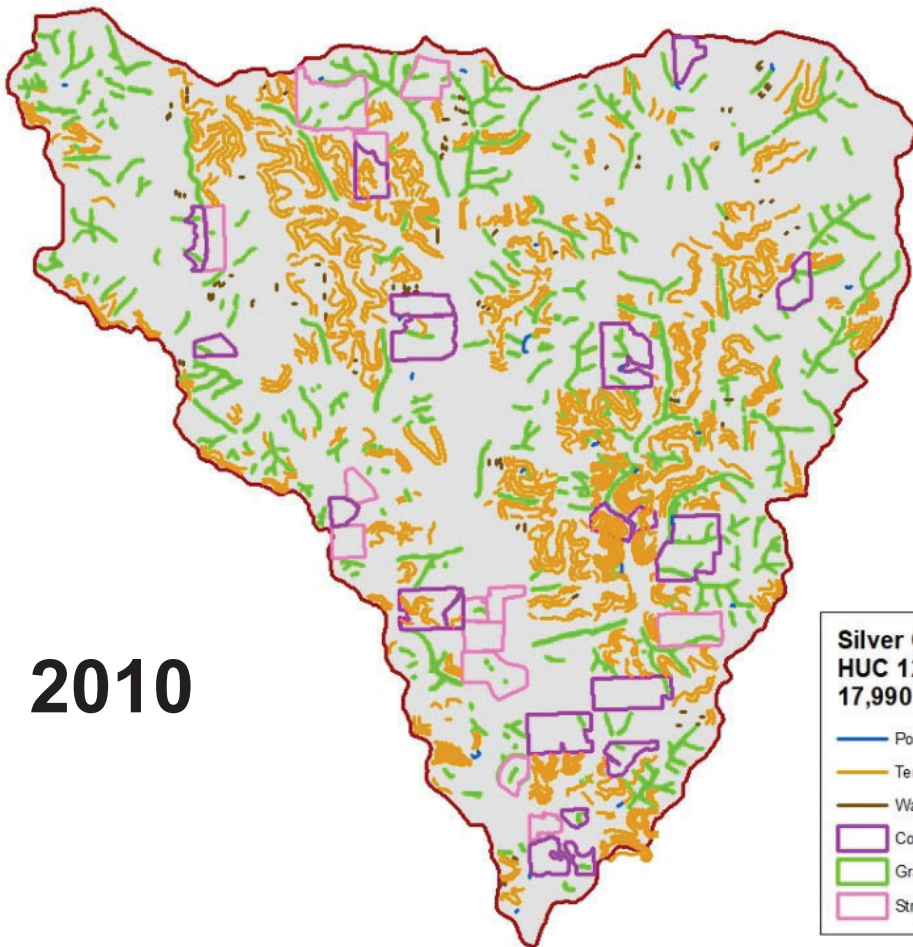




**1980s**







**Silver Creek - 1980s**  
**HUC 12 - 070600040401**  
**17,990 Acres**

-  Pond Dam
-  Terrace
-  Water and Sediment Control Basin
-  Contour Buffer Strips
-  Grassed Waterway
-  Stripcropping

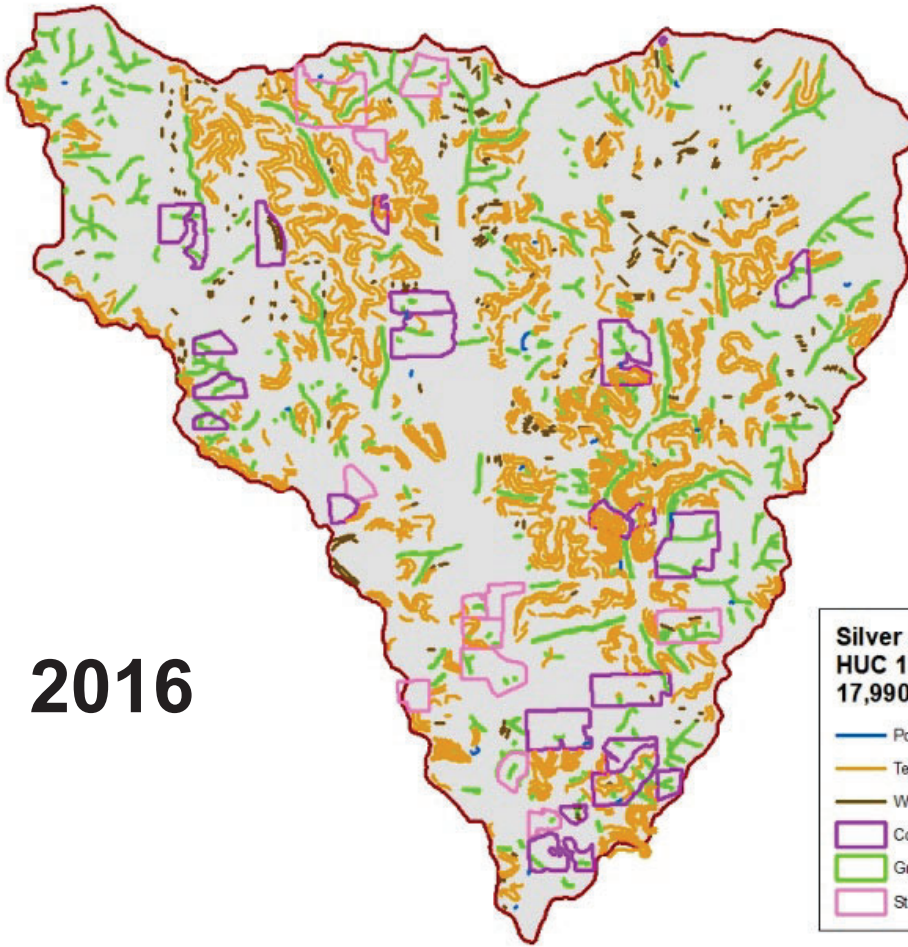


**2010**

**Silver Creek - 2010**  
**HUC 12 - 070600040401**  
**17,990 Acres**

-  Pond Dam
-  Terrace
-  Water and Sediment Control Basin
-  Contour Buffer Strips
-  Grassed Waterway
-  Stripcropping

# 2016



**Silver Creek - 2016**  
**HUC 12 - 070600040401**  
**17,990 Acres**

- Pond Dam
- Terrace
- Water and Sediment Control Basin
- Contour Buffer Strips
- Grassed Waterway
- Stripcropping

Practice	1980s	2010	2016	Gain/Loss 80s-2016	% Change 80s- 2016	Rate Change/ Yr 80s- 2010	Rate Change/ Yr 2010- 2016	Rate Change/ Yr 80s- 2016
Ponds	20	22	21	1	5%	0.1	-0.2	0.0
Terraces (miles)	41	135	155	114	276%	3.1	3.4	3.2
WASCOBs (miles)	0.1	2.8	11.9	11.8	8400%	0.1	1.5	0.3
Grassed Waterways (ac)	78	298	251	172	219%	7.3	-8.0	4.8
Contour Buffers (ac)	551	1022	1101	549	100%	15.7	13.2	15.3
Stripcropping (ac)	75	633	580	505	674%	18.6	-8.8	14.0

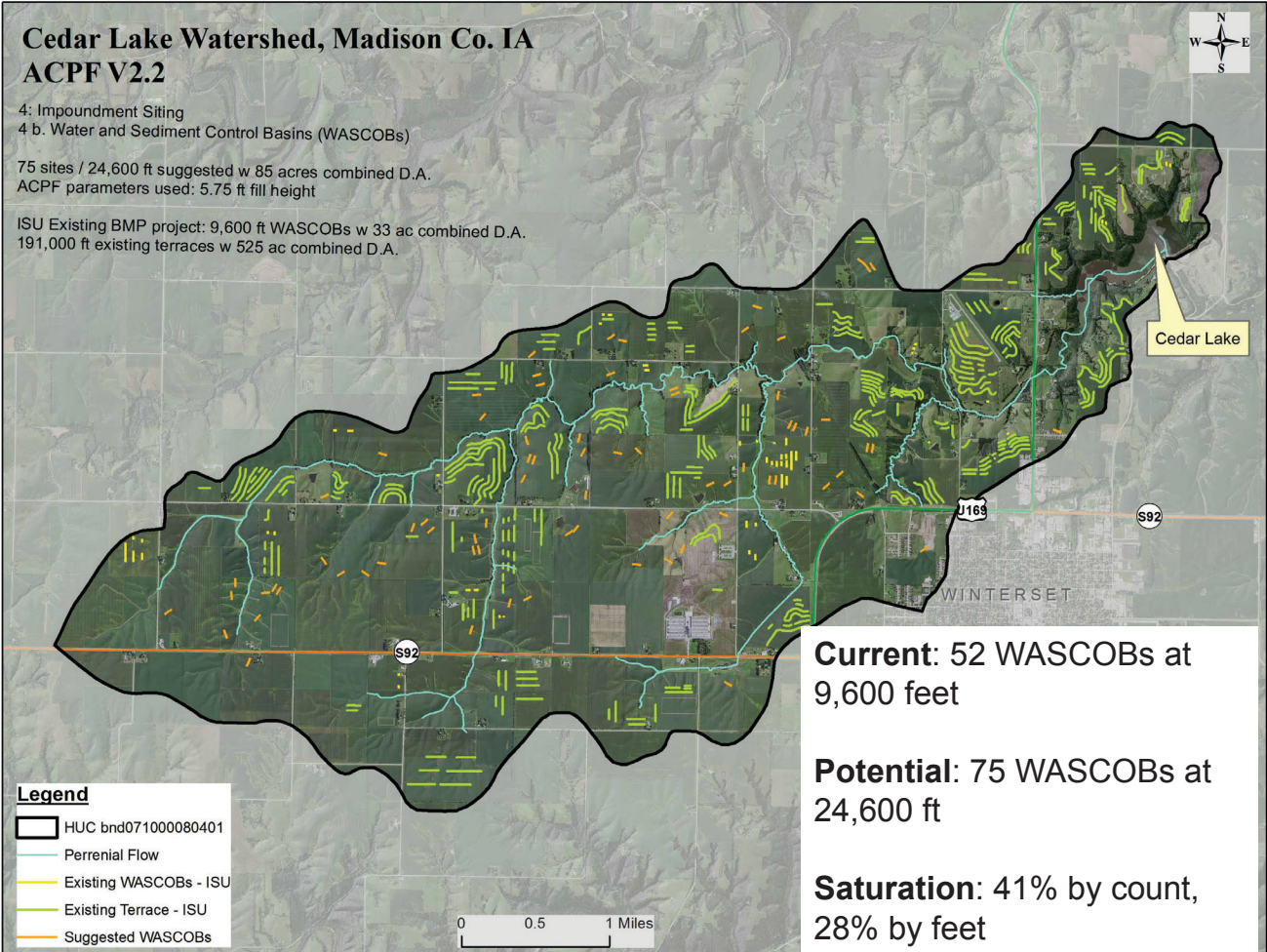


# Cedar Lake Watershed, Madison Co. IA ACPF V2.2

4: Impoundment Siting  
4 b. Water and Sediment Control Basins (WASCOBs)

75 sites / 24,600 ft suggested w 85 acres combined D.A.  
ACPF parameters used: 5.75 ft fill height

ISU Existing BMP project: 9,600 ft WASCOBs w 33 ac combined D.A.  
191,000 ft existing terraces w 525 ac combined D.A.



## Artificial Intelligence Opportunities

